Cancelled - obsolete

Chapter 37

VOLTAGE REGULATOR, TYPE 22/50836 (PILOT)

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LEADING PARTICULARS

Voltage regulator, Type 22/50836	*Ref. No.* 5UC/6138
Controlled voltage (operating in conjunction with Type 50/42909*E)*	28·0 *volts* ± 2½ *per cent*
Pile resistance range	0·6 *to* 6·0 *ohms*
Maximum pile loading	30 *watts*
Actual loading	2 *watts*
Carbon pile	*Ref. No.* 5UC/2164
Pile heater (60 *ohms*, 20 *watt*)	*Ref. No.* 5UC/6268
Operating coil current	0·47 *to* 0·5 *amp*
Operating coil resistance	17·75 *ohms cold*
Equalizing coil	0·7 *ohms*
Ballast resistor (33 *ohms*, 12 *watt*)	*Ref. No.* 5UC/2857
Trimmer resistor (separate) (10 *ohms*, 7½ *watt*)	*Ref. No.* 5UC/5780
Stabilizing transformer, Type LTC-B3/1 *(separate)*	*Ref. No.* 5UC/6273
Ratio	2:3
Primary winding (excluding 60*-ohm resistance)*	24·0 *ohms*
Secondary winding	10·7 *ohms*
Primary series restistance	60 *ohms*

Introduction

1. The pilot voltage regulator, Type 22/50836, is used in conjunction with the main regulator, Type 50/42909E, to control the output of the a.c. generator, Type LA2413, Form B/10, at 28 volts ± 2½ per cent.

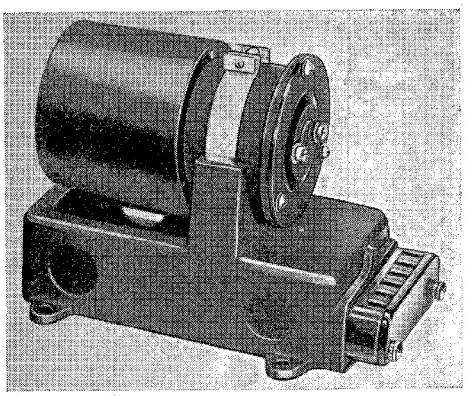

Fig. 1. Voltage regulator, Type 22/50836 (pilot)

DESCRIPTION

2. This regulator (fig. 1) is of the single carbon pile type, and in general construction and principle of operation is similar to the standard design as described in A.P. 113D-0003—16 (formerly A.P.4343, Vol. 1, Sect. 6, Chap. 1). The pile is approximately 1·5 in. long and consists of not less than nine 1 mm. washers, interleaved with ten 3 mm. washers. Starting and finishing with a 3 mm. washer.

3. The regulator unit is mounted on a base, beneath which are the pile heater unit and the ballast resistor. The pile heater is incorporated to maintain the pile temperature above freezing point when operating at high altitudes.

4. A circuit diagram of the installation, incorporating the main and pilot regulators and an additional stability transformer and trimmer resistor, is given in fig. 2. The carbon pile of the main regulator is connected in the generator field circuit in the conventional way, and the operating coil is connected across the rectified generator output. The carbon pile of the pilot regulator is connected across a portion of the operating coil of the main regulator, and also across the rectified generator output.

5. When the operating coil of the pilot regulator is unexcited, its pile resistance is a minimum, of the order of 0·1 ohm, and thus tends to short-circuit part of the operating coil of the main regulator. As the generator speeds up, with a single carbon pile system

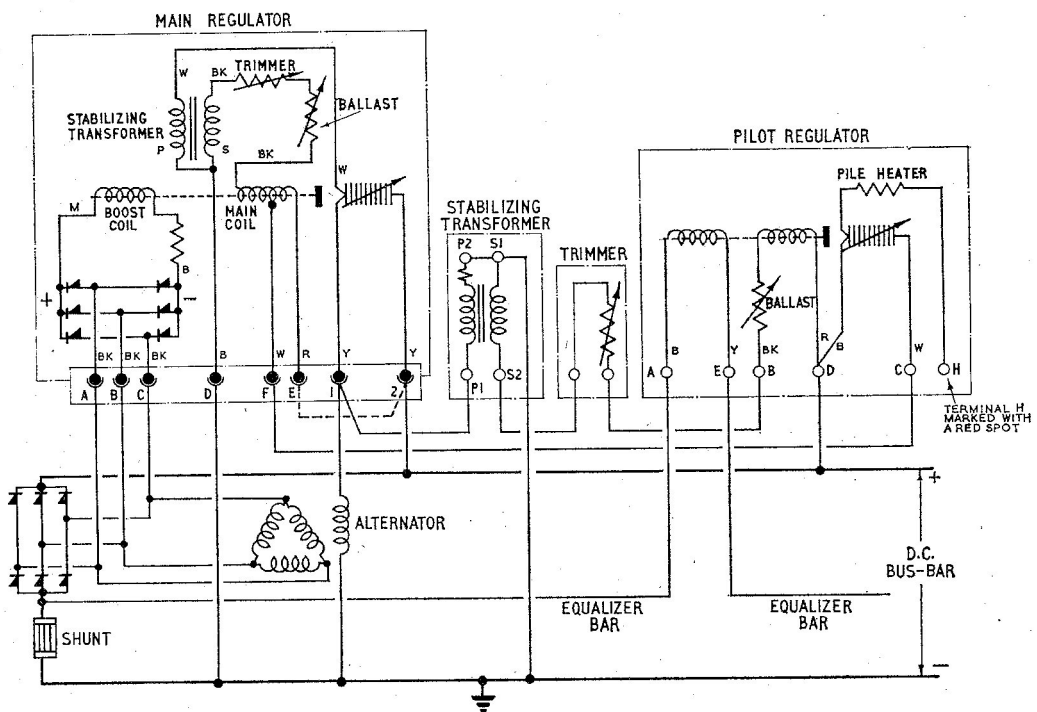

Fig. 2. Circuit diagram

of control the pressure on the carbon pile is reduced when the voltage approaches the controlled value, resulting in rapid increase of the pile minimum resistance value.

6. By using a pilot system, however, since a substantial portion of the main coil is short-circuited, very little increase in the minimum resistance takes place from the "dead" value until the controlled voltage at which the pilot regulator is set is reached. In this way a wide resistance range with a low minimum resistance is obtained, which is not possible with a single regulator.

7. The main regulator with the complete coil in circuit is adjusted to operate at 24·5 volts, but with a portion of its coil shunted by the carbon pile of the pilot regulator, the controlled voltage level will rise to approximately 31·5 volts. The pilot regulator is adjusted to control at 28 volts, so that when this voltage is reached, the resistance of the carbon pile of the latter will increase to such a value as to permit more current through the shunted portion of the main coil and thus maintain the whole system at $28{\cdot}0 \pm \frac{1}{2}$ volt.

8. Load sharing is controlled by an external shunt resistance, operating in conjunction with an equalizer coil in the pilot regulator. An increase in the load on any one generator will increase the voltage across the resistance, and cause a current to flow in the equalizer coil such as will assist the action of the pilot regulator operating coil and reduce the generator output voltage. In the equalizer coils of the other pilot regulators the current flow is in the opposite direction, thus increasing the output voltage of those generators and so restoring balance in the system.

INSTALLATION

9. The regulator must be mounted with the axis of the carbon pile horizontal, and the regulator base in a vertical plane. It should be in a position such that there is no restriction to free circulating air through the pile housing.

SERVICING

10. General servicing instructions for this type of regulator are given in A.P.113D-0003—16 (formerly A.P.4343, Vol. 1, Sect. 6, Chap. 1). That publication describes the fitting of a new pile stack and the preliminary mechanical adjustment for a regulator which is completely out of order. The latter part of this publication gives information on Repair and Reconditioning on this type of regulator. When any adjustment is made, the regulator must afterwards be subjected to a full test.

Note . . .

The correct setting for the pile compression screw on this regulator, after the regulator has been correctly dipped, is a half turn in from the dip position.

Appendix A

STANDARD SERVICEABILITY TEST FOR VOLTAGE REGULATOR, TYPE 22/50836 (PILOT)

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LIST OF ILLUSTRATIONS

Introduction

1. The following tests should be applied to the regulator whenever it is necessary to determine its serviceability. The main regulator Type 50/42909E should have previously been tested in accordance with the procedure described in Chap. 36, App. A.

Test equipment

2. The following items of test equipment will be required when testing the regulator:

(1) Main regulator Type 50/42909E, Ref. No. 5UC/6137.

(2) Stabilizing transformer Type L.T.C.—B3/1, Ref. No. 5UC/6273.

(3) Remote trimmer 10 ohms, 7·5W, Ref. No. 5UC/5780.

(4) Generator Type 515, Ref. No. 5UA/5570.

(5) Resistor variable 0-15 ohms (R1), Ref. No. 10W/9846.

(6) Switch S.P.20A (S1) Type N.S.F., Ref. No. 5CW/6518.

(7) Multimeter Type 12889 (V2), Ref. No. 5QP/17447.

(8) Voltmeter 0-40V (V1), Ref. No. 5Q/234.

(9) Voltmeter 0-40V (V3), Ref. No. 5Q/234.

(10) Ammeter 0-20A (A1), Ref. No. 5Q/25093.

(11) Ammeter 0-1A (A2), Ref. No. 5Q/10856.

TEST PROCEDURE

General

3. Connect the regulator Type 22/50836 to the test circuit as shown in Fig. 1. This circuit shows the regulator connected to a generator Type 515 series; but if this generator is not available any generator which is used with this regulator may be substituted.

4. Resistor R1 should be adjusted to 11·5 ohms and switch S1 closed for all tests except those described in para. 8.

5. Apply 21V 3-phase a.c. to terminals A, B and C or, alternatively, disconnect the boost coil lead from the positive side of the rectifier and excite with 26V d.c. of the correct polarity.

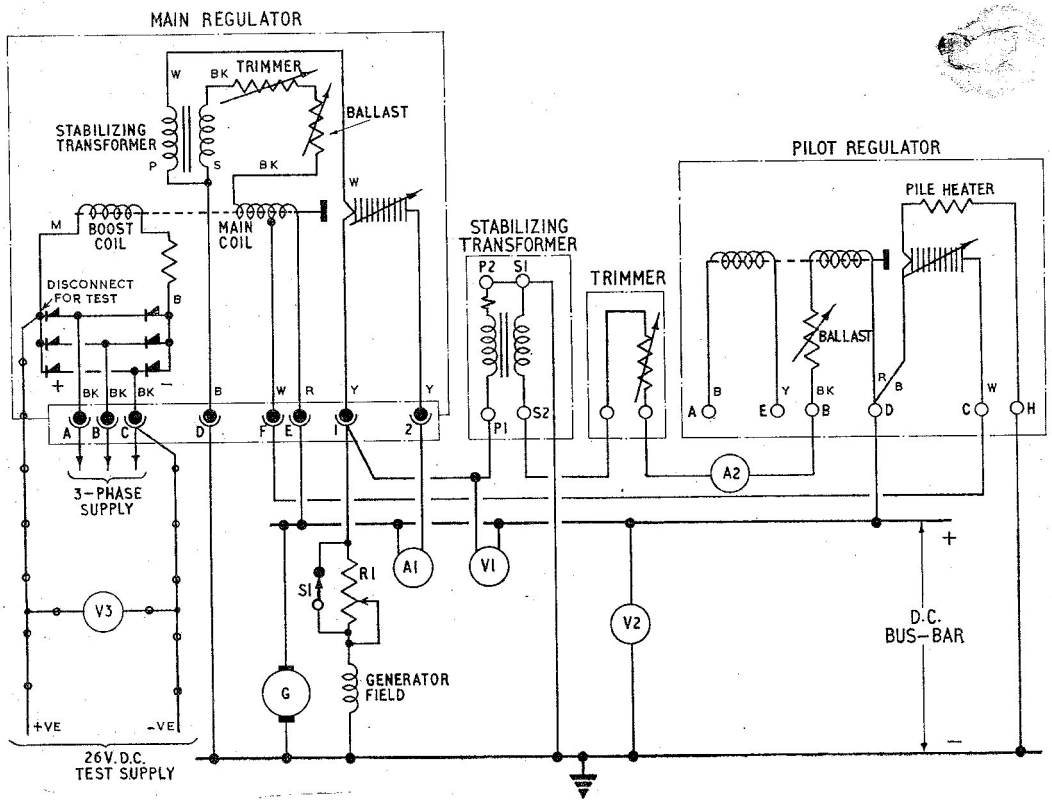

Fig. 1. Test circuit diagram

6. With the regulator cold, run the generator at 5000 rev/min. Set the remote trimmer in the electrical mid position. The output voltage V2 should be 28V and the coil current A2 within the limits of 0·47A and 0·5A. If this voltage and current is not obtained refer to A.P.113D-0003—16, para. 40-45 (formerly A.P.4343, Vol. 1, Sect. 6, Chap. 1, para. 40-45).

Note . . .

The correct setting for the pile compression screw on this regulator, after the regulator has been correctly dipped, is a $\frac{1}{2}$ *turn in from the dip position.*

Regulation test

7. Run the generator over a speed range to give a main regulator pile resistance of 0·5 to 12 to 0·5 ohm measured by the ratio V1/A1. Over this cyclic variation of pile resistance the controlled voltage should be maintained within the limits of 27·5V and 28·5V.

Stability test

8. Run the generator at a speed to give a main regulator pile resistance of 12 ohms measured by the ratio V1/A1. By rapid switching of S1 the main regulator pile will have to cover a resistance range of 0·5 to 12 ohms, and under these conditions it should respond with no tendency to hunt.

9. Provided the regulator satisfies the test in para. 8, turn the pile compression screw of the pilot regulator $\frac{1}{4}$ turn counter-clockwise, and repeat the test detailed in para. 8. If there is any tendency towards hunting on rapid switching of S1, turn the compression screw clockwise until the hunting just stops. Turn the screw a further $\frac{1}{4}$ turn clockwise and lock in this position. At this setting repeat the regulation test.

Insulation resistance test

10. Using the insulation resistance tester Type C, measure the insulation between all connecting leads and the frame. The reading should be not less than 5 megohms. Measure the insulation resistance between the operating coil terminals B, D and the equalizing coil terminals A and E, the reading should be not less than 5 megohms.

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